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Experimental Investigation of Corn Shelling Machine

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Abstract: ***Assessing the performance characteristics of the developed corn shelling machine is the focus of this paper. Corn shelling machine was fabricated based on an engineering design approach with the aid of software (CAD) and values and was later fabricated at K.D.K College of Engineering, Nagpur Workshop using suitable materials after considering the factors such as Hardness, ease of machining, tensile strength, availability, durability, and the cost. The machine is electrically operated by an electric motor with a power rating of 2.235 kW, speed of 1430 rpm, and torque of 14.92 Nm. Corn losses and damages were found to be very negligible.***
Keywords: Corn, Shelling, Machine, Design, Development

I. INTRODUCTION

Processed corn is used in the manufacturing of many products, starting from breakfast foods, corn meal-flour and grits, starch, corn syrup, corn oil, spirits, acetone, chemical, absorbent, seed, and silage. Therefore, a large quantity of maize is needed to meet the need of the agro-allied industries in providing the afore-stated items for the use and survival of humanity. The increased quality of maize can be enhanced by devising an effective method of processing. The sequence of maize processing includes harvesting, de-husking, shelling, winnowing, drying, bagging, and storage. Maize shelling is defined as the removal of grains from the cobs by the initial impact, and rubbing action as the material passes through a restricted clearance between the cylinder, and concave bars. The performance of these hand-operated shelling machines is limited and can cater to only domestic maize requirements.

Power-operated machines including Mo hinder, radar, Armar, sherdur, amude, spike tooth tropical motorized maize shelling machine, and Francis smith shelling machine have been used till date, and can handle a large amount of cobs butte cost of purchase is prohibitive for the local farmers. Tractor operated shelling machine is the most costly among maize shelling machines, because it demands the additional cost of a tractor for the operation of the machine; but has an added advantage of providing the facility for cobs transportation. The existing shelling machines have another problem in the area of increased damage to the grains while shelling them from the cobs. This made the manual method better than the machining method because of the low grain damage witnessed in it.

Therefore, an effort towards minimizing grain damage while engaging in mass production, during the shelling process, will be commendable. Therefore, information on the most influential factories is needed by designers, to incorporate the right shelling cylinder into the shelling machine that will promote high efficiency with few corn grains damages.

II. CAD MODEL OF CORN SHELLING MACHINE

After that design complete semi-atomize machine, then regarding development done on shelling, grading and crushing machine. Parameters will be selected according to objectives. 3D diagrams & photos of each components and assembled machine and line diagrams with labelling. The various instruments used for fabrication of machine. Following are the main components of machine:-

- MOTOR
- TOP COVER
- GRILL DRUM
- BOTTOM COVER
- PEDESTALS BEARING
- PULLEYS (200 MM & 40MM)
- V-BELT
- THRESHER CYLINDER
- FOUNDATION FRAME

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1) Motor

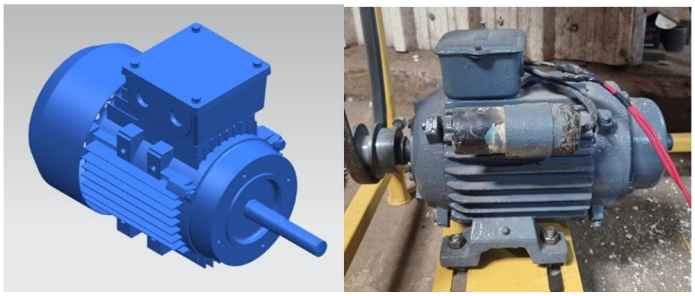


Fig.1 Model & Actual Photo of Motor

Function: An electric motor is an electrical machine that converts electrical energy into mechanical energy. Most electric operate through the interaction between the motor's magnetic field and winding currents to generate force in the form of rotation. In project we have used 1hp motor with speed of 1440 rpm.

2) Top Cover

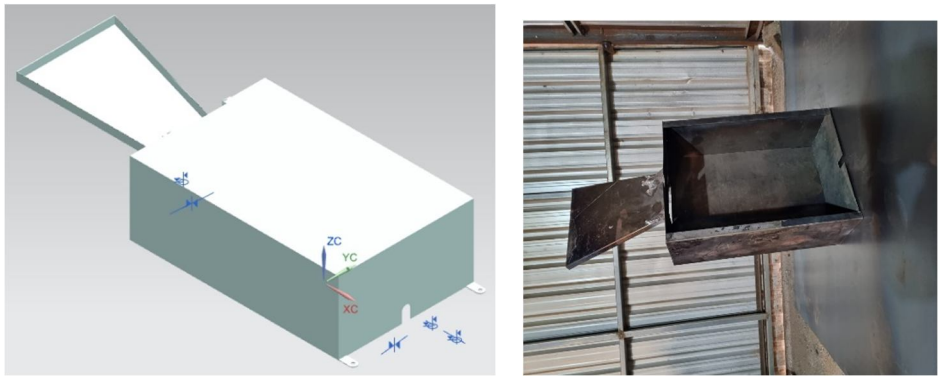


Fig 2 Model & Actual Photo of Top Cover

Function: Main Function of Top Cover is collect the corn which gets shell from cob. Corn shelling is done under grill drum, through grill drum corn get separated from drum to output.

3) Grill Drum

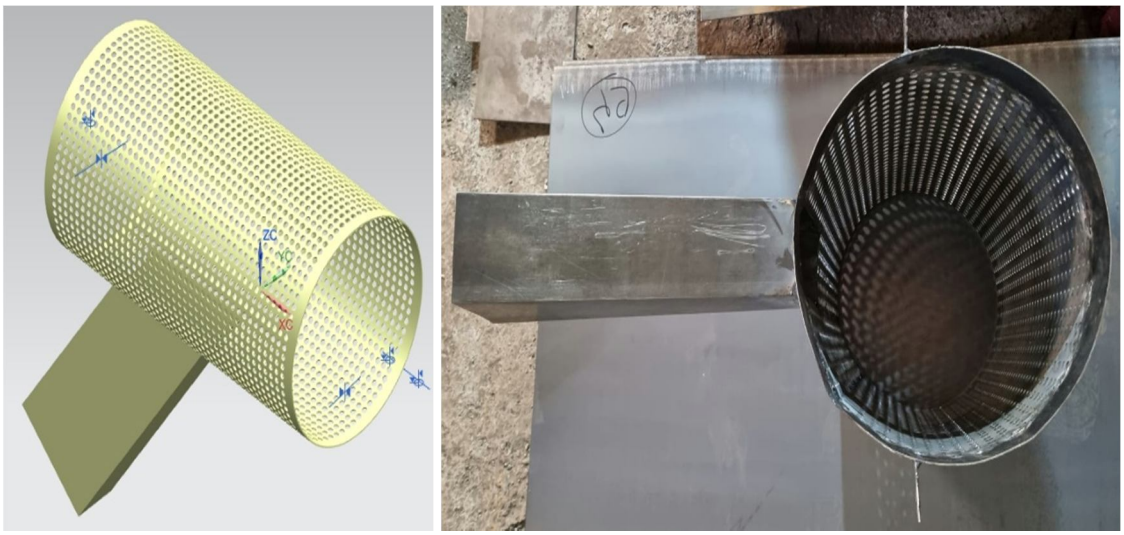


Fig 3 Model & Actual photo of Drum

Function: Drum is provided for shelling of corn by friction between grill and drum.

4) Bottom Cover

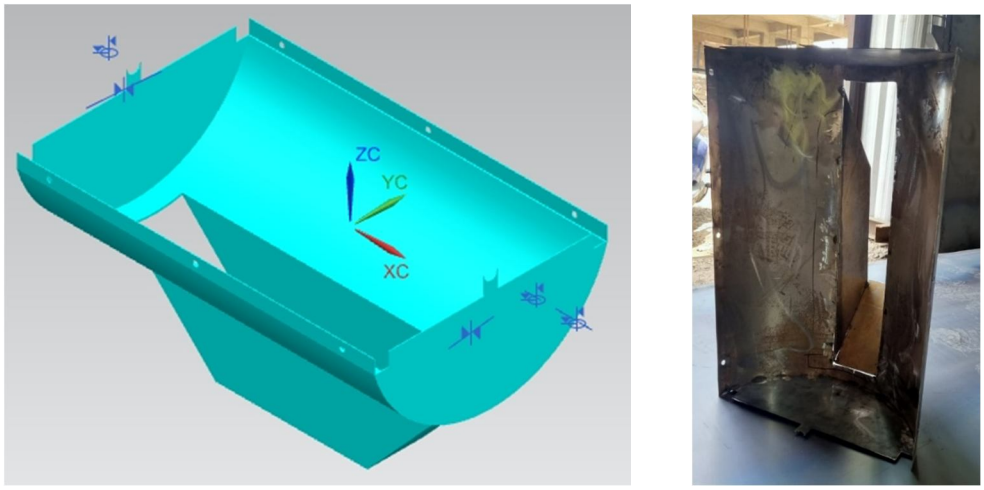


Fig.4 Model & Actual Photo of Semi-circular Grill

Function: Semi-circular grill is the stationary member, shearing action take place with the help of it and also helps to fall corn which collected from outlet box.

5) Pedestals Bearing

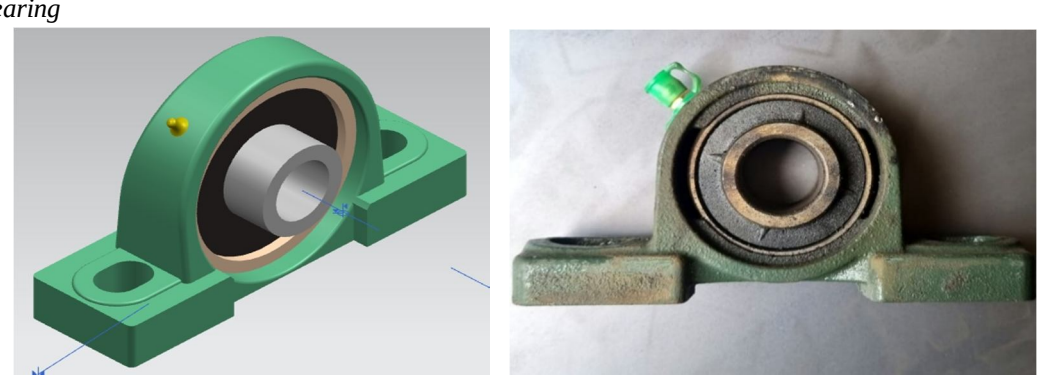


Fig 5 Model & Actual Photo of Pedestals Bearing

The bearing no.P205 is used for supporting the roll shaft. The pedestals are used for supporting the bearing. They work as bearing housing. Her details of pedestals used are given below, The 2 pedestals are fixed on the body of the foundation frame.
Function: Guided the shaft in proper direction.

6) Pulleys

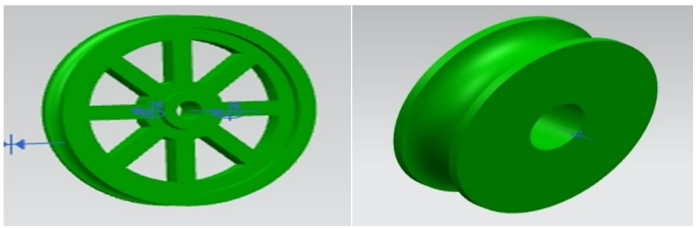


Fig.6 Model Photo of Pulley

Material Of Pulley Cast Iron (Ci) The pulley used is V-belt, B-section pulleys. The details of pulley used in “CORN SHELLER” are as follow
Function: Pulley is used to transmit power from one shaft to another shaft.

7) V- Belt

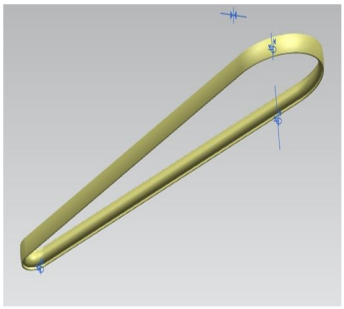


Fig..7 Model & Actual Photo of V-Belt

Function: V-Belts are the most common type of drive belt used for power transmission. Their primary function is to transmit power from a primary source, like a motor, to a secondary driven unit. They provide the best combination of traction, speed transfer, load distribution, and extended service life.

8) Thesher Cylinder

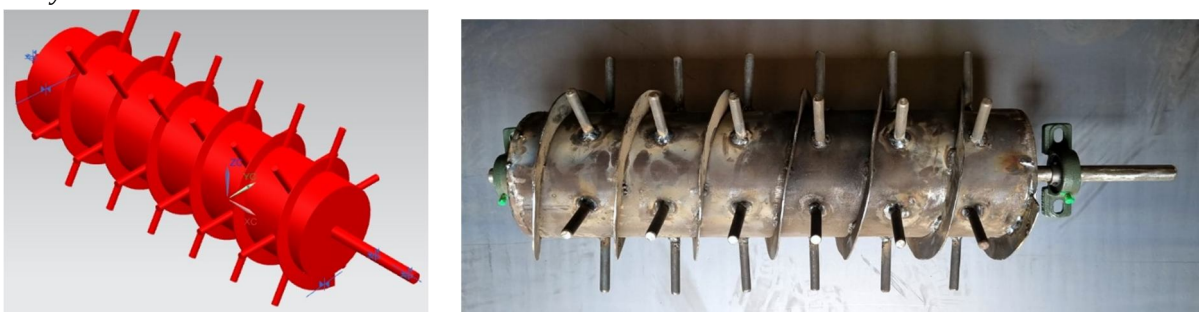


Fig 8. Model & Actual Photo Blade

The cob comes out from the Sheller Machine and enter into the crusher machine and it will crush and husk is formed. This husk is further used for the feeding purpose for animals and it may be used as fuel for domestic use.
Function: To decob cob from corn .

9) Foundation Frame

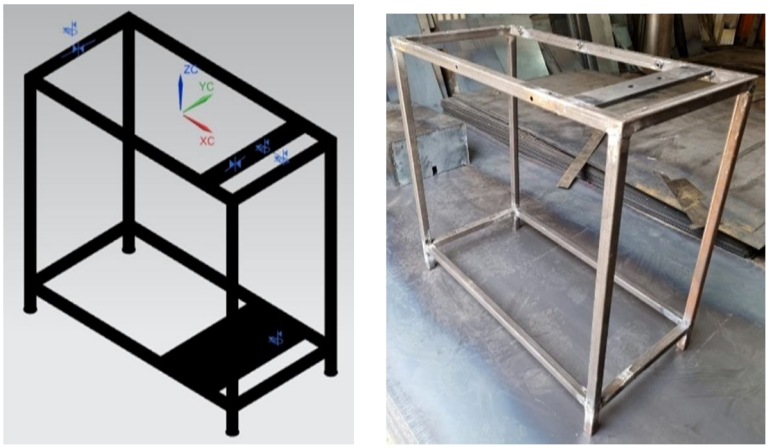


Fig.10 Model & Actual Photo of Foundation Frame

Function: Frame is used to provide the support. It perform the function of vibration damping. It also provide mechanical strength to machine.

III. ASSEMBLY

The arrangement of various component of "CORN SHELLING MACHINE" is being done are as follows:

1) The foundation frame is being selected which carry the entire load of the machine.
2) The bottom cover is mounted on the foundation frame with the bolt, nut is welded on foundation frame, which is fasten using nut and bolt
3) The grill drum is placed at the center of foundation frame, bolt are inserted in hole of the foundation frame.
4) The thresher shaft is mounted on the top of the foundation frame with the help of pedestals bearing which is fasten using nut and bolt.
5) Grading system is introduced below drum which has two outlets namely outlet one and outlet two.
6) The top cover with hopper is mounted on the side of foundation frame covering the grill drum, and fastened with nut and bolt
7) Cover of foundation frame (top face) which provide entire covering is fasten using bolts.
8) Motor is mounted on the bottom side of frame where stands are made for it.
9) 8 inch, and 2.5 inch pulley is mounted on roller and motor shaft respectively, over which belt is mounted for transmission of power.

The above arrangement ensure that all element of the project are balanced and also centre of gravity of the assembly is on axis as that of the center of gravity human body that is on spinal cord.

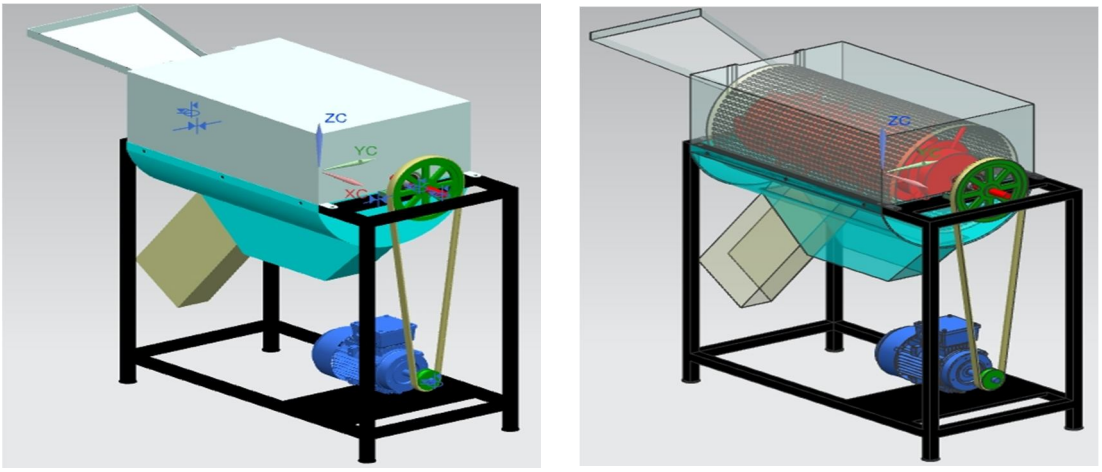


Fig 5.3.1 Final Model Assembly of Corn Sheller



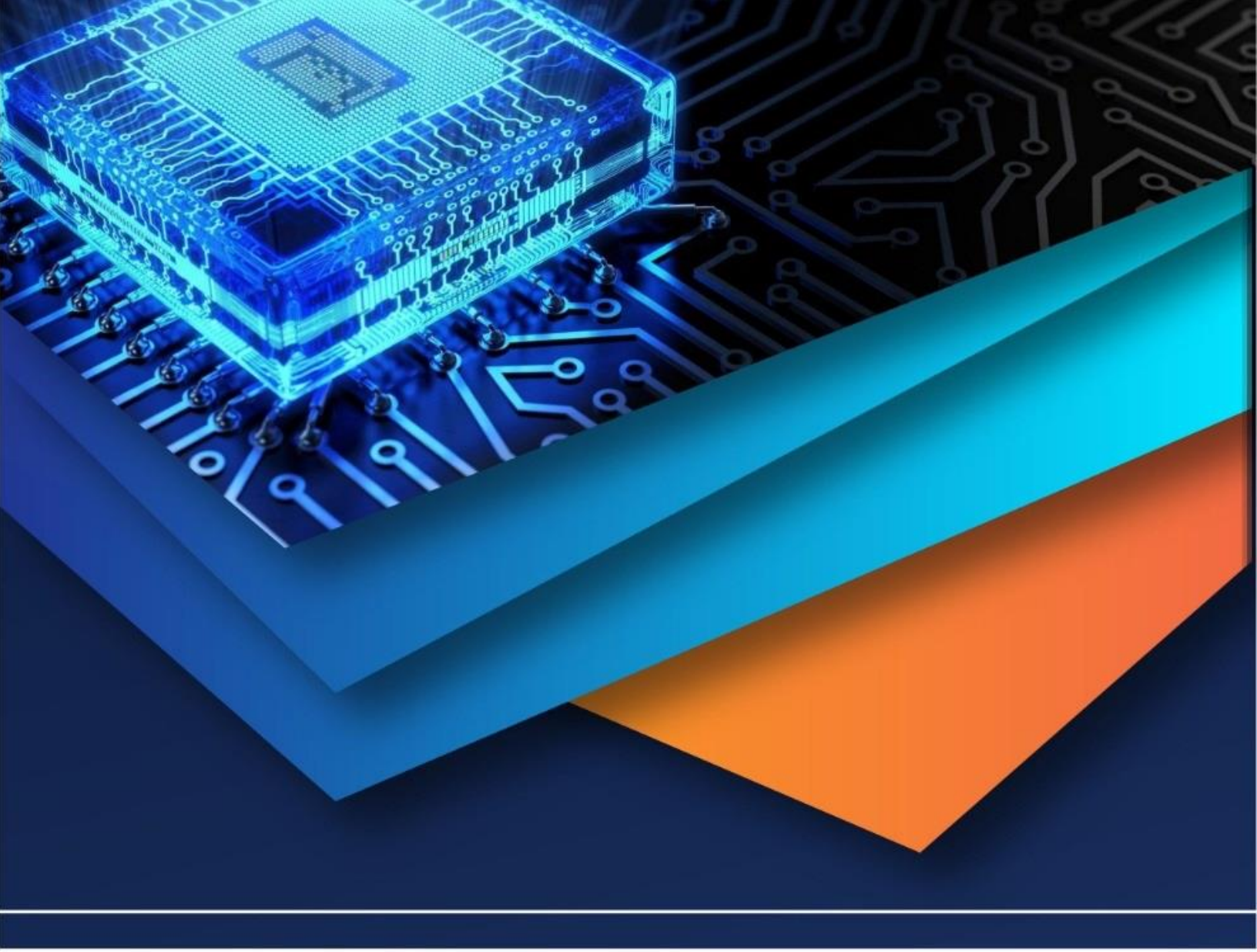
Fig 2 Final Assembly of Corn Sheller

IV. ACKNOWLEDGEMENT

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